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Abstract: In order to provide a structural framework for the application of mobile technology in business processes that can serve as a basis for understanding the organizational impacts of mobile technologies, we present a model, the „Mobility-M“. It puts the technology and the business processes in context with each other by using the theory of informational added values. The aim is to facilitate and visualize the use of mobile technologies according to their potential benefits and effects. This model and its graphical representation significantly enhance the orientation within the introduction of mobile business processes.

1 Introduction

Enterprises start to realize the importance of fully integrating mobile workplaces in their inner- and inter-organizational business processes. At the same time device-to-device communication – e.g. via radio frequency identification systems (RFID) – gains importance.

The application of mobile technologies can have two effects, better support for existing mobility in business processes and enabling of mobility where it was not possible before. The fundamental capabilities do not lie in the support of existing methods of operation and collaboration but in the opportunity to create new ones. Therefore, processes have to be changed, or, as is claimed in [KPW03]: “Mobile technology needs new business processes.” The application of mobile technologies requires the understanding of its particularities as well as a rigorous analysis of their effects, allowing for an application of the concept of *business process reengineering* [HC93] to mobile business processes.

This contribution proposes a structural framework for the application of mobile technology in business processes. The framework represents an integrated view of these two and thus can serve as a basis for understanding the organizational impacts of mobile technologies. Process enhancements that can be realized by introducing new mobile processes will be evaluated by the Theory of Informational Added Values and its extension by the concept of Mobile Added Values.

In the following, section 2 introduces mobile business processes; section 3 explains the elements of the analysis and combines them to the “Mobility-M” framework. Section 4 presents conclusions and outlook.

2 Mobile Business Processes

The support of business processes by information technology is widespread over all levels and functions in modern organizations. Information systems (e.g. *Enterprise Resource Planning, ERP*) principally allow for a complete mapping of the process chain. As a consequence, physical resources and processes are no longer managed directly by managers but indirectly with (real-time) information that represents these processes, activities and resources [Ma00].

Typically, this support is limited to stationary workplaces while the introduction of any kind of mobility into the business processes poses a major problem. The lack of support by the stationary information systems results in the non-integration of mobile workplaces into the process chain which leads to the effect that mobile workers often spend more time with the procurement and transmission of information, i.e. for (voice) communication with other process-involved persons, than for the execution of their central tasks. This communication regularly contains standard information such as disposability of goods or resources. The phenomenon also applies for employees in the other parts of the value chain – e.g. scheduling or warehousing – who have to work closely with mobile workers and, thus, must devote a high portion of their working time to communication. A schematic representation of the problem is provided by fig. 1.

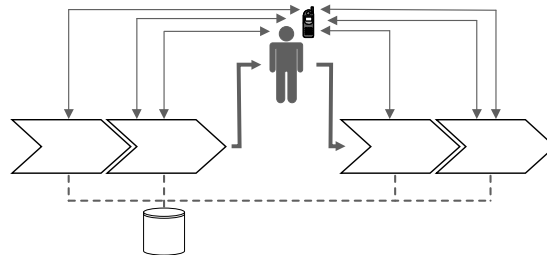


Figure 1: Visualization of the non-integration of mobile workplaces into to process chain [TP03]

Additional coordination problems are caused by the movement of goods or machines without knowledge of their location/status and by inter-organizational processes which for instance play a prominent role in Supply Chain activities.

Koehler and Gruhn differentiate *mobile business processes* from general business processes by the spatial distribution of the process actors [KG04]. This comprises only mobile workplaces. For our purposes we define mobile business processes (MBP) as above and additionally include device-to-device communication where devices act as representatives of actors and the actors themselves do not necessarily have to be mobile.

The element of mobile information technology support can be brought into business processes mainly by two elements, the direct support of the mobile workforce and the equipment of machines, vehicles and devices of any kind with mobile technology.

The *mobile workforce* can be classified into

- Employees, mobile on the premises (e.g. in-house technicians, warehousemen),
- Employees, mobile outside the premises (e.g. members of the sales force),
- Employees and executives in companies with mobile operations (e.g. postal

- services, transportation, vending machines, building and construction) and
- Decision makers [TP03].

The integration of mobile technology in machines, vehicles and devices of any kind allows, above all, for the tracking and tracing of these, e.g. by the use of radio-based identification systems, and for remote control solutions.

3 Analysis and Framework

3.1 Elements of the analysis

As we observed in several projects, an analysis of mobile business processes and their support by mobile technology requires, above all, four elements.

For the mobile technology itself we have to distinguish and specify the used devices, mobile communication techniques and infrastructure. This may e.g. be the use of smartphones where communication relies on GPRS and therefore the infrastructure is provided externally by the mobile network operator, in another case it may be the use of RFID tags, where the infrastructure has to be provided completely while the used communication techniques are system-inherent.

For the application domain in the enterprise we categorize the functional areas (based on theoretical reflections as well as extensive case study analysis [e.g. PMV+04]) as follows: Supply Chain Management (SCM), Customer Relationship Management (CRM), Administration (including office functionality), operations, Business Intelligence. The category *operations* particularly (but not exclusively) refers to organizations whose core business is mobile (cf. section 2), such as logistics service providers, building and construction companies or intervention forces such as police or firefighters.

In order to provide a link between these two domains, it is necessary to examine the emerging impacts on business processes as well as the particular qualities of mobile technology that induce these impacts. For this purpose we apply the Theory of Informational Added Values and its extension to Mobile Business.

The emerging impacts on business processes can be categorized with eight Informational Added Values (IAV). The two predominant IAV are the *Efficiency* and the *Effectiveness Added Values*. Moreover, *Aesthetic-emotional Added Values*, *Flexible Added Values*, *Innovative Added Values*, *Organizational Added Values* and finally, *Strategic* and *Macroeconomic Added Values* can be achieved. The distinctive impacts of mobile technology can be traced back to the four Mobile Added Values (MAV) of ubiquity, context-sensitivity, identifying functions and command and control functions. For a detailed explanation of these assessment concepts see [BPT04].

3.2 Combination to a framework

After introducing the elements, the second step is to integrate the different views on mobile processes. For this purpose we propose a scheme with four quadrants, each of them containing one of the named elements. For reasons of better visual representation, we propose to arrange the quadrants in the form of the letter “M” which on the one hand reminds to the term “mobility” but on the other hand shows the sequence of the analysis.

The scheme is composed of a mobile technology-oriented left side and a business-oriented right side. Each side is based on a pillar and contains a connecting “roof”. Due to its visual representation, we denominate it *Mobility-M* (see figure 2).

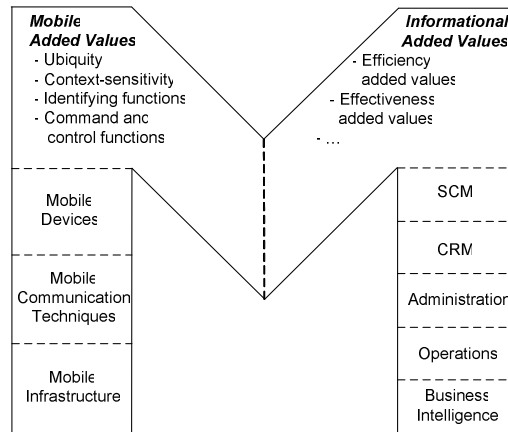


Figure 2. The *Mobility-M* framework

The left pillar of the “M” contains the different elements of mobile technology that are necessary for mobile business processes. This technological view is based on the infrastructure and the communication techniques that permit the use of mobile devices for communication and data transmission. The right pillar encompasses the different functional areas in which MBP are located. This view covers the value chain containing the different areas as referred to in section 3.1. As these different application areas are not specific to any industry, the *Mobility-M* provides a generic framework for mobile activities in organizations.

The two pillars are connected by the MAV and IAV that show how the use of mobile technologies can lead to process enhancements. MAV are located on top of the mobile technologies as the application of these technologies leads to MAV whereas the IAV are situated on top of the functional areas where they are realized.

As mentioned above, the arrangement of the elements in the *Mobility-M* also suggests an order of how to evaluate the possibilities and benefits of the introduction of mobile business processes. The different steps of this evaluation are represented in figure 3.

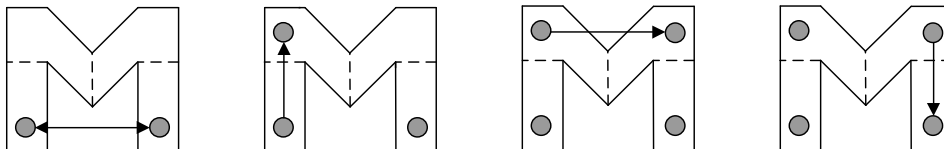


Figure 3. Application of *Mobility-M*

In the first step the organization has to consider its business processes and the mobile technologies available. The methods of business process reengineering can be applied in this phase with mobile technology providing enabling functions for the redesign of new

mobile processes. In the second step the application of mobile technology is evaluated. At least one MAV has to be employed by the mobile business process to generate process enhancements compared to the existing business process.

These process enhancements are assessed in step three of figure 3 by the extent to which the employment of MAV lead to the realization of IAV. In this phase, the qualitative approach of the value added theory has to be accompanied by financial calculations concerning the investment and the potential ROI. The results of this evaluation lead to the decision if the mobile process will be implemented which is represented by step four.

4 Conclusions and Outlook

In this contribution we introduced the concept of the *Mobility-M* as a generic framework for the application of mobile technology in business processes that can serve as a basis for understanding the organizational impacts of mobile technologies. It puts the technology and the business processes into context by using the Theory of Informational Added Values and its extension to Mobile Business. The framework allows evaluating the use of mobile technologies according to their potential benefits. The model and its graphical representation significantly enhance the orientation within the introduction of mobile business processes. It is now possible to arrange existing knowledge and current research projects into this framework in order to structurally measure the application of mobile technologies in business processes and facilitate the application of Business Process Reengineering to the mobile business which we call *Mobile Business Process Reengineering (Mobile BPR or M-BPR)*.

Further research concerning the application and the evaluation of the *Mobility-M* will especially include further refinement as well as exploratory case study research.

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